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| EXAMINER | |
|---|---|
| LEE, SHUN K | |
| **ART UNIT** | **PAPER NUMBER** |
| 2884 | |

DATE MAILED: 09/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

SV

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/534,204 | IMAI ET AL. | |
| | Examiner | Art Unit | |
| | Shun Lee | 2884 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *21 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-8,59,62 and 64-72* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,59,62 and 64-72* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of species I (claims 1-8) in Paper No. 12 has been acknowledged.

### *Claim Objections*

2. Claims 70-72 are objected to because of the following informalities:

(a) in claim 70, "apparatus" on line 1 should probably be --system--;

(b) in claim 71, "apparatus" on line 1 should probably be --system--; and

(c) in claim 72, "apparatus" on line 1 should probably be --method--.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-8, 59, 62, and 64-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Karellas (US 5,864,146) in view of Street *et al.* (US 5,164,809), Perez-Mendez (US 5,596,198), Takahashi *et al.* (US 5,059,794), and Oikawa *et al.* (US 5,483,071).

In regard to claims **5-7**, **65**, **68**, **70**, and **71**, Karellas discloses (Fig. 37) an image read-out system comprising:

(a) a stimulating light source (1302) which emits stimulating light (1310) in a wavelength range of not shorter than 600 nm (column 34, lines 54-63),

(b) a stimulating light scanning means which causes the stimulating light (1310) emitted from the stimulating light source to scan (column 34, lines 54-56) a stimulable phosphor sheet (1306) having a layer of stimulable phosphor which emits stimulated emission in a wavelength range not longer than 500 nm (column 35, lines 1-8) in proportion to the stored energy of radiation upon exposure to the stimulating light (1310),

(c) a solid image sensor (electronic area detector 1312) having a photoconductive material layer the major component of which is a-Se (*i.e.*, amorphous selenium; column 40, lines 1-9) and which exhibits electric conductivity upon exposure to the stimulated emission from the stimulable phosphor sheet (1306), and

(d) an image signal obtaining means (*i.e.*, pixelated readout; column 40, lines 1-9) which detects electric charges generated in the photoconductive material layer of

the solid image sensor (electronic area detector 1312) when the stimulable phosphor sheet (1306) is exposed to the stimulating light (1310) and stimulated emission emitted from the stimulable phosphor sheet (1306) impinges upon the photoconductive material layer, and detects an image signal representing an image stored on the stimulable phosphor sheet (1306).

While Karellas also discloses (Fig. 5) that an image sensor comprises pixels disposed in a first direction and a second direction perpendicular to the first direction, wherein the pixels disposed in the first direction are separated by a pixel element pitch, so that each pixel in the first direction is in a one-to-one correspondence with a picture element and (column 40, lines 1-9) obtaining an image signal by pixelated readout of the amorphous selenium image sensor, the system of Karellas lacks that each pixel comprises of a spaced apart electrode in a first direction which is in one-to-one correspondence to each pixel and a second electrode structure comprising at least one of: planar electrode and spaced apart electrodes disposed in a second direction perpendicular to the first direction, and wherein an electric voltage imparting means imparts an electric voltage to the electrodes dispose to physically touch opposite sides of a 1 μm to 100 μm (or 10 μm to 50 μm) thick photoconductive material layer so as to apply an electric field which generates an avalanche amplification effect in the photoconductive material layer of the solid image sensor during impingement of the stimulated emission. However, pixelated readout is known in the art. For example, Street *et al.* teach (column 3, lines 28-68) that a-Si image sensors include a multiple electrode grid structure comprising electrodes (13, 14, 15 in Figs. 1 and 2) physically touching the a-Si material and wherein

orthogonal electrodes (13, 14) are disposed on opposite sides of the a-Si material. In addition, Perez-Mendez teaches (column 6, lines 57-67) that equivalent detector materials are selectable form a group of like properties such as a-Si and a-Se. Further, a-Se photoconductive material layer properties are well known in the art. For example, Takahashi *et al.* teach (column 2, lines 18-22 and 47-58; column 7, lines 15-39) to apply an electric field to an a-Se photoconductive material layer (*e.g.*, 2 μm thick; column 6, lines 15-39) sufficient for avalanche amplification in order to increase optical detection sensitivity when using a laser stimulable phosphor. Oikawa *et al.* teach (Fig. 7) to provide a 4 to 20 μm thick (column 4, lines 21-29) a-Se photoconductive material layer (13) sandwiched by electrodes (12, 41) with one (41) of the electrodes (12, 41) connected to a FET (45) wherein the photoconductive film (13) is for converting (column 2, lines 15-16) an optical image into an image based on electric charges with an avalanche effect in order to obtain an excellent electron multiplying function (column 4, lines 21-29). Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to apply a sufficient electric field to (*e.g.*, a 10 μm thick) a-Se photoconductive material layer at each spaced apart pixel electrode in the system of Karellas during pixelated readout, in order to increase optical detection sensitivity as taught by Takahashi *et al.*

In regard to claims **1-3**, **62**, **64**, **66**, **67**, and **69**, the method steps are implicit for the modified apparatus of Karellas since the structure is the same as the applicant's apparatus of claims 5-7, 65, and 68.

In regard to claim **4** (which is dependent on claim 1) and claims **8** and **59** (which are dependent on claim 5), the system of Karellas lacks a fluctuation suppressing means that suppresses image signal fluctuations due to fluctuation in the electric field applied to the photoconductive material layer (*e.g.*, by correcting the image signal according to applied electric field fluctuations from voltage power source fluctuations). However, photoconductor quantum efficiency ($\eta$) as a function of applied electric field (E) is well known in the art. For example, Takahashi *et al.* (Fig. 3) teach that there is a steep increase in quantum efficiency ($\eta$) when the applied electric field (E) increases. In addition it is important to recognize (see for example Eq. 4 of Takahashi *et al.*) that quantum efficiency ($\eta$) denotes efficiency for conversion of light (L) into charge (Q). Thus Q is proportional to $\eta$ which is a function of both L and E and image signal $S = g(Q) = g(h_A(L_E,E)) = f_A(L_E,E)$. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide a fluctuation suppressing means (*e.g.*, $S = f_A(L_E,E)$) in the system of Karellas, so that the image signal (S) is indicative of the stimulated emission ($L_E$) and thus representative of the image stored on the stimulable phosphor sheet.

In regard to claim **72** which is dependent on claim 1, Karellas also discloses (column 34, lines 32-37) that the stimulable phosphor sheet stores a latent image based on the energy of radiation upon exposure (*i.e.*, without application of voltage to the stimulable phosphor sheet structure).

**_Response to Arguments_**

6. Applicant's arguments filed 21 June 2006 have been fully considered but they are not persuasive.

Applicant argues (second paragraph on pg. 11 of remarks filed 21 June 2006) that the avalanche effect would not permit incremental, low intensity-based read-out for purposes of saturation avoidance. Examiner respectfully disagrees. Karellas states (column 33, lines 30-37) that "Pixel saturation can be controlled, however, by adaptive multiple excitation and sampling of the area detector. Instead of reading out the phosphor with a single excitation and detection, the stimulable phosphor is read out by a number of excitations and readouts. In most cases, two to five excitations and readouts will be sufficient. The individual images can be added arid averaged in order to increase the signal-or noise ratio and overall detectability" and (column 36, line 19 to column 37, line 7) that "The use of the intensifier not only enables amplification of the signal ... a less then full discharge of the photostimulable phosphor plate can provide a sufficiently strong signal and avoid saturation ... ". Thus Karellas teaches to perform a number of excitations and readouts wherein the excitation is adjusted so that each readout is within the available dynamic range of a detector which provides amplification of the signal, in order to obtain the express goal of increased signal-or noise ratio and overall detectability. Therefore, Karellas discloses that the avalanche effect would permit incremental, low intensity-based read-out for purposes of saturation avoidance.

Applicant also argues (second paragraph on pg. 11 of remarks filed 21 June 2006) that the high voltages would induce thermal noise and increase dark

currents. Examiner respectfully disagrees. First it is noted that this broad statement does not appear to be supported by any explanation or cited evidence. The thermal noise of a detector depends on the detector temperature and the dark current of a detector depends on the design, material, and operation of the detector (*e.g.*, see column 33, line 54 to column 34, line 22 of Karellas). Thus, applicant's arguments that high voltages would induce thermal noise and increase dark currents are not persuasive.

Applicant argues (second paragraph on pg. 11 of remarks filed 21 June 2006) that column 7, lines 49-55 of Perez-Mendez would similarly teach away from use of an avalanche condition for similar reasons. Examiner respectfully disagrees. Perez-Mendez states (column 7, lines 49-55) that "The thermally generated noise, can be reduced significantly by lowering the ambient temperature of the camera 10, by for instance placing the camera 10 in a refrigerator during operation, in order to maintain the camera 10 at a temperature ranging from -30° C. and 0° C. With this configuration, a 3 minute integration period can be achieved". Thus the passage cited by applicant only describes low temperature operation to reduce thermally generated noise. Therefore, applicant's arguments that column 7, lines 49-55 of Perez-Mendez would similarly teach away from use of an avalanche condition are not persuasive.

Applicant argues (last paragraph on pg. 11 of remarks filed 21 June 2006) that the references Oikawa, Perez-Mendez, and Karellas employ TFT'S or CCD'S as charge accumulating sections would not permit avalanche effects. Examiner respectfully disagrees. It should be noted that this argument rests on at least two unsupported

assumptions. First, there is no evidence provided that the detector including elements such as TFT wherein the elements are located within the avalanche amplification electric field. Second, there is also no evidence provided that even if the elements are located within the avalanche amplification electric field, that the avalanche amplification electric field is of a magnitude sufficient to cause damage to the elements such as TFT. On the contrary, detectors comprising of elements such as FET and wherein the detectors are operated with avalanche amplification electric fields are well known in the art (see *e.g.*, Oikawa *et al.*).

Applicant argues (first paragraph on pg. 12 of remarks filed 21 June 2006) that Takahashi does not include a phosphor layer capable of storing a latent image. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant's arguments (first two paragraphs on pg. 13 of remarks filed 21 June 2006) with respect to amended claims have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shun Lee whose telephone number is (571) 272-2439. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SL

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